We claim:

1. An apparatus for analyzing the characteristics of a geometric feature formed on a sample comprising:

a spectroscopic ellipsometer system including a broad band probe beam directed to reflect off the geometric feature and a spectrometer for measuring the reflected probe beam and generating output signals, said ellipsometer including at least one of a polarizer, analyzer and compensator arranged so that the change in phase of the probe beam can be determined as a function of wavelength; and

a processor system including a master processor and a plurality of individual slave processors arranged to process data in parallel, said processor system using the output signals generated by the spectrometer to characterize the geometric feature on a real time basis, said processor system using an algorithm which includes a model of the geometric feature and which calculates a set of theoretical data at each of a plurality of wavelengths based on an initial assumption of the characteristics of the geometric feature and compares the theoretical data to normalized data derived from the output signals and thereafter modifies the assumption of the characteristics of the sample based on the results of the comparison and recalculates a new set of theoretical data, with the comparison and recalculation steps being repeated until the differences between the calculated theoretical data and the normalized data are minimized and wherein the calculation of theoretical data is distributed by the master processor to the slave processors and wherein each slave processor performs calculations at selected wavelengths in parallel so that the time needed to reach the desired result is minimized.

2. An apparatus as recited in claim 1, wherein the various wavelength calculations are distributed among the processors in a manner so that the time required to perform the calculations is minimized.

3. An apparatus as recited in claim 1, wherein the master processor performs the comparison steps.

4. An apparatus as recited in claim 3, wherein the master processor modifies the characteristics of the theoretical model.

5. An apparatus as recited in claim 1, further including a spectroscopic reflectometer generating output signals and wherein the processor system combines the output signals from the spectroscopic ellipsometer and the spectroscopic reflectometer to reduce ambiguities in the analysis.

6. An apparatus for analyzing the characteristics of a geometric feature formed on a sample comprising:

a spectroscopic ellipsometer system including a broad band probe beam directed to reflect off the geometric feature and a spectrometer for measuring the reflected probe beam and generating output signals, said ellipsometer including at least one of a polarizer, analyzer and compensator arranged so that the change in phase of the probe beam can be determined as a function of wavelength; and

a processor system for evaluating the characteristics of the geometric feature based on the output signals generated by the spectrometer, said processor system for calculating theoretical data corresponding to the response of a theoretical sample to broadband radiation at a plurality of individual wavelengths, said processor system including a plurality of processor modules and with the calculations of theoretical data for selected wavelengths being distributed across the processor modules for performing the calculations in parallel and wherein the resulting theoretical data is compared to normalized data derived from the output signals of the spectrometer and wherein the characteristics of the theoretical sample is iteratively modified in order to minimize the differences between the calculated theoretical data and the normalized data.

7. An apparatus as recited in claim 6, wherein the various wavelength calculations are distributed among the processor modules in a manner so that the time required to perform the calculations is minimized.

8. An apparatus as recited in claim 6, wherein one of said processor modules performs the comparison steps.

9. An apparatus as recited in claim 8, wherein said one processor module modifies the characteristics of the theoretical sample.

10. An apparatus as recited in claim 6, further including a spectroscopic reflectometer generating output signals and wherein the processor system combines the output signals from the spectroscopic ellipsometer and the spectroscopic reflectometer to reduce ambiguities in the analysis.

11. A method for analyzing the characteristics of a geometric feature formed on a sample comprising the steps of:

illuminating the sample in the region of the geometric feature with broadband light;

measuring light reflected from the sample and generating output signals as a function of wavelength;

causing the light to pass through at least one of a polarizer, analyzer and compensator prior to being measured;

calculating theoretical data corresponding to the response of a theoretical sample to broadband radiation at a plurality of individual wavelengths, with the calculations of theoretical data for selected wavelengths being distributed across a plurality of processor modules for performing the calculations in parallel;

comparing the resulting theoretical data to normalized data derived from the output signals; and

iteratively modifying the theoretical sample in order to minimize the differences between the calculated theoretical data and the normalized data to evaluate the characteristics of the geometric feature.

12. A method as recited in claim 11, wherein one of said processor modules performs the comparison steps.

13. An apparatus as recited in claim 12, wherein said one processor module modifies the characteristics of the theoretical sample.

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